the paper already quoted, there should, of course, be ether pulses in the X-ray stream, and the γ stream also for that matter, and it may possibly be these which have been the subject of experiment by Marx, and which show Mr. Barkla's polarisation effects. But I think it is certain that at least the γ rays are material, and those X-rays which give rise to a secondary kathode radiation of a speed due to a few thousand volts. W. H. BRAGG.

The University of Adelaide, South Australia,
December 12, 1907.

Drifted Ice-crystals.

THE accompanying photographs, showing the incipient freezing of the sea during severe frost on January 4 at Littlehampton, may be of interest to readers of NATURE. They were taken about high water, at 11 a.m. A high N.E. wind and the flowing tide had drifted ice-crystals formed on the surface of the sea into the slack water in the angle between the east side of the small pier and the shore, until they were collected in a viscous layer covering the whole angle. The layer seemed to be more than an inch thick.

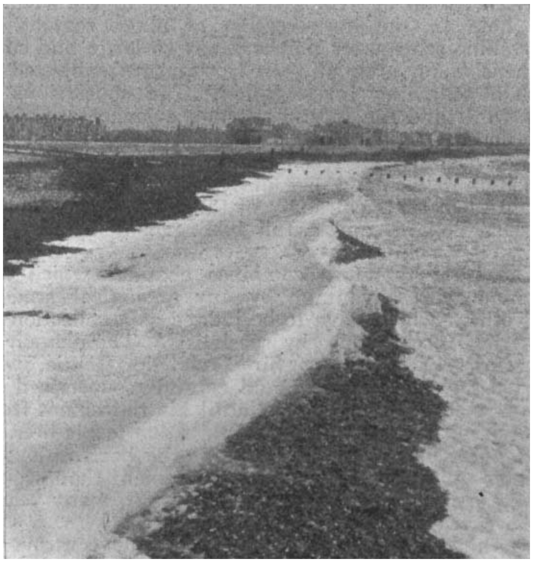

FIG. 1 – Bank of drifted Ice-crystals.

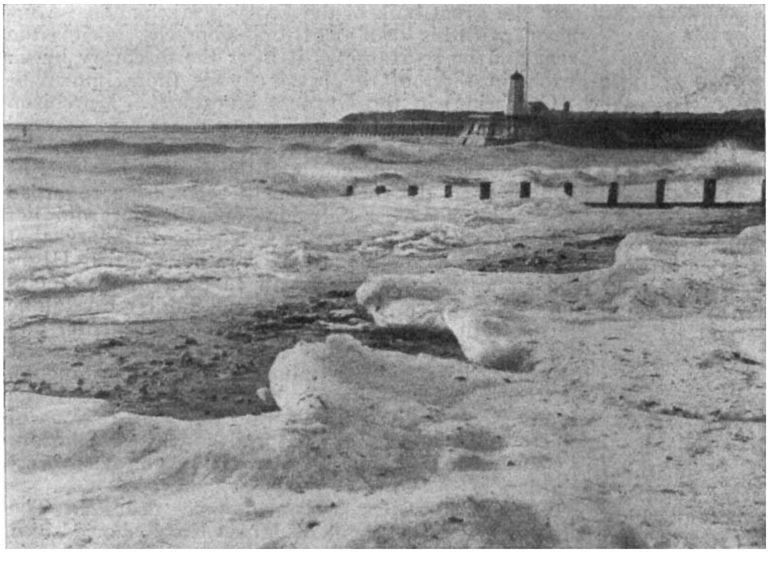

FIG. 2.—Layer of drifted Ice-crystals.

The photographs show the border of ice-crystals thrown up on the beach, with a vertical front towards the sea about 18 inches high.

The effect disappeared rapidly when the tide began to fall. The timbers of the pier were thickly coated with ice at high-water mark, and as far above as the splashing reached, but remained perfectly clear below this line.

WALTER LEAF.

The Interpretation of Mendelian Phenomena.

DR. G. ARCHDALL REID has recently suggested (1) that Mendelian phenomena occur only under artificial conditions, and (2) that they are to be explained in terms, not of segregation, but of "latency" and "patency." As regards the latter contention, it appears to me that it would be justified if, in the case of experiments conducted under stringent conditions, dominant characteristics were, even occasionally, to appear in recessive generations or *vice versâ*; but if this is not the case it seems an abuse of language to describe a thing as "latent" which never gives any manifestation of its existence. Further, Dr. Reid's theory does not explain—as the Mendelian theory does—why these characteristics not only appear and disappear, but play this game of hide-and-seek in accordance with strict numerical rules.

As to the other point, that Mendelian phenomena are confined to cultivated varieties, it is extremely difficult to prove or disprove, because to ascertain the phenomena you must experiment, and to experiment is to place under artificial conditions. But the well-ascertained facts of conjugation and cell-mitosis, which Mr. R. H. Lock regards as affording considerable support to the doctrine of gametic purity, are certainly not confined to cultivated varieties. That all inheritance may be particulate was long ago suspected by Galton, who speaks of skin colour as possibly "a fine mosaic too minute for its elements to be distinguished in a general view" ("Natural Inheritance," p. 12).

May I suggest one line of inquiry that may possibly prove fruitful in competent hands? Is there any connection between the variability of a plant or animal and the number or size of its chromosomes? Man, for example, has a large number of chromosomes, and is extremely variable. The correspondence would no doubt be far from exact if we suppose with Mr. Lock that the biological units are not the chromosomes themselves, but the chromomeres or some even minuter subdivisions. But it might be assumed, at any rate as a first approximation, that the ultimate units were roughly proportional to the number and size of the chromosomes, and in that case species possessing many and large chromosomes would be likely to have a larger stock of the raw material of variation than their fellows. H. H. O'FARRELL.

East India United Service Club,
St. James's Square, S.W.,
December 30, 1907.

Musical Sands.

IN reply to Prof. Poynting's letter (NATURE, January 16), may I say that the article which appeared in NATURE (August 6, 1901) was only intended to supplement my paper of 1888, by recording the results of further investigations up to date, and to show that I claimed, both by analytical and synthetical methods, to have proved the theory previously dealt with in detail?

In that paper (1888) I rejected the conception that the notes emitted from musical sands were due to the vibra-

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tion of the individual grains as separate particles, because the contact of one grain with another would prevent such vibrations, and suggested that the only other explanation possible was that certain grains, in *rubbing* one against another, might produce the required vibrations through surface friction.

The music from sands is a cumulative effect, and only possible under the prevalence of numerous favourable conditions, and I found that if I eliminated one apparently insignificant factor from the conditions upon which my theory was based, the production of musical sands artificially became impossible.

Until an artificial musical sand can be produced exclusively under the conditions suggested by Profs. Poynting and Thomson in "Sound," I submit that my explanation may be retained. CECIL CARUS-WILSON.

Filtration of Rain Water.

I WISH to ask the opinion of someone in regard to the filtration of rain water, and the removal of any sediment, before it finds its way into large underground cisterns holding fully 15,000 gallons.

It will not be difficult or costly to collect the water and pump it up for use in a large laundry. A pump can be worked by the engine close by.

The point is how to prevent a lot of smuts, &c., finding their way into the cisterns, which would necessitate the frequent removal of this stuff, an operation that would be both difficult and expensive.

Is there any way by which filtration can be carried out above ground?

I shall be glad to know of any way to meet the difficulty.

January 13. ENQUIRER.

THE HIGHLAND OVERTHRUSTS.[1]

THE controversy regarding the structure of the north-western Highlands was a disturbing factor in the progress of geology from 1819, when the problem was first raised by Macculloch, until it was closed in 1884 by Sir Archibald Geikie's announcement in NATURE (vol. xxxi., p. 29) that the generally accepted view could no longer be maintained. The NATURE article—perhaps the most sensational announcement in geological literature—was followed in 1888 by a report from six members of the Scottish Geological Survey (Messrs. Peach, Horne, Gunn, Clough, Hinxman, and Cadell), giving a summary of the evidence which they had collected as to the structure of the north-western Highlands; and it has taken another twenty years to complete the survey of the whole overthrust region and prepare the detailed observations for publication. The full results are now issued in an elaborate monograph, the most important and the cheapest publication ever issued by the British Geological Survey. It includes 700 crowded pages, 52 artistic and instructive plates, and a beautiful colour-printed geological map of the whole area on the scale of four miles to the inch. The price of the book is 10*s.* 6*d.* The Survey is to be congratulated on having secured for this memoir a style of production far superior to the usual standard, and on its issue at a price which should ensure for it a wide circulation.

The book no doubt suffers from the inevitable compromise between conflicting requirements. Many readers will never have the opportunity of visiting north-western Scotland, and they will seek in this volume for a clear statement of the general results; their needs are satisfied by the fine photographic plates of the scenery, which show the overthrust structures more clearly than they are often visible through the persistent mists of the west Highland hills, and by the masterly introductory statements by Dr. Horne in chapters i., iii., xxxii., and xl. (of the last of which Dr. Teall is joint author), and the corresponding chapters by Hinxman on the Torridonian, and by Horne and Peach on the Cambrian. The memoir has also to serve as a field handbook to those who can visit the district. Accordingly it has to give precise information, which cannot be too detailed, as to localities and sections. The bulk of the book consists of detailed local descriptions, written by Messrs. Peach, Horne, Clough, Hinxman, and the late W. Gunn, with notes by Cadell, Greenly, and Harker. A third group of geologists will turn to the volume for help in the investigation of other regions of crystalline schists, for nowhere has so large and comprehensive an area of these rocks been subjected to such a searching investigation. The conclusions of this work and the most important evidence are given in a detailed account by Dr. Teall of the gneisses, and altered sedimentary rocks associated with them. The appendix includes a list of fossils and fossiliferous localities, a chemical study of the Durness Dolomites by Dr. Pollard, and a full bibliography by Mr. D. Tait.

The book therefore combines chapters which can be read with advantage by any geological student and others which have to be judged as a collection of materials for reference by specialists. The memoir is appropriately edited by Sir Archibald Geikie, who started the work in 1883, and carefully supervised its progress for eighteen years, until his retirement from the Survey in 1901. It is doubtless due to his literary skill and sense of proportion that the book enjoys a greater uniformity in style and treatment than would be expected in a work extending over so many years, and written by so many men.

The history of the north-west Highlands controversy is summarised in a chapter by Dr. Horne, who lucidly states the results of all previously published geological work on the district. The geological interest of the area dates from the announcement by Macculloch, in 1819, of his discovery of fossiliferous rocks lying above gneisses, and covered by the gneisses and schists that form the great bulk of the Scottish Highlands. Murchison, with his keen scent for a good clue, visited the area, and he re-examined it after the discovery by C. Peach, in 1854, of the better fossils (now known to be Cambrian) in the Durness limestones. Murchison was convinced that the fossiliferous rocks were covered by the eastern gneisses, and, in accordance with the law of superposition, accepted the eastern gneisses as younger than the rocks beneath them. He regarded the fossils as Lower Silurian, and therefore did not shrink from the apparently inevitable corollary that most of the crystalline rocks of the Scottish Highlands are post-Lower Silurian in age. This conclusion had a world-wide influence. Similar crystalline schists form vast regions in all the continents, and they were at first regarded as all pre-Palæozoic; but if the Scottish schists are altered Palæozoic sediments, then the similar rocks elsewhere may include rocks of any geological age. To this day vast regions of schists and gneisses are mapped as altered Silurian, in consequence of Murchison's work on the north-west Highlands.

Murchison's views were at once opposed. The common-sense judgment of James Nicol showed him the improbability of Murchison's conclusions, and his keen and careful field-work revealed that the superimposing of schists over sediments was not an original arrangement, but was due to subsequent earth movements. The first controversy was short. Nicol's inter-

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[1] Memoirs of the Geological Survey of Great Britain. The Geological Structure of the North-west Highlands of Scotland. By B. N. Peach, John Horne, the late W. Gunn, C. T. Clough and L. Hinxman, with Petrological Chapters and Notes by J. J. H. Teall. Edited by Sir A. Geikie. Pp. xviii+668; plates lii., map. (Glasgow: H.M. Stationery Office, 1907.) Price 10*s.* 6*d.*

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